IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application:

Hiroshi TAKANASHI et al.

Serial No. 09/262,077

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For: NEGATIVE-WORKING PHOTOSENSITIVE RESIN COMPOSITION

AND PHOTOSENSITIVE RESIN PLATE USING THE SAME

DECLARATION UNDER 37 CFR 1.132

Honorable Commissioner of Patents and Trademarks,

Washington, D. C.   20231

Sir:

I, Hiroshi TAKANASHI, a Japanese citizen, residing at 24-11, Nishirokugo 1-chome, Ota-ku, Tokyo, Japan, hereby declare and state that I am one of the inventors of the above-titled application.

I declare that I graduated from the Department of Industrial Chemistry, Faculty of Engineering at Kanto Gakuin University in Kanagawa-ken, Japan, in March 1970 and that I received Bachelor's degree in Engineering.

I also declare that I have been employed by Tokyo Ohka Kogyo Co., Ltd., the Assignee of this application, since April 1970, and that I am engaged in the research and development of photosensitive resin composition at the Specialty

Development Division.

I declare further that I have read all of the Office Actions in the above-entitled patent application, and have read and am familiar with each of the references cited in the Office Actions by the Examiner.

I declare further that the following test was conducted by myself and that the test results are true and correct to the best of my knowledge.

REPORT OF EXPERIMENTAL RESULTS

INTRODUCTION:

The object of the present invention is to obtain a deep depth of non-printing areas, such as reverse lines, dent dots and reverse characters, in photocured images of a reverse printing plate. For attaining the object, a specific small amount of 0.001 - 0.3 wt% of component (E) having the formula (I) is incorporated into a photoresist resin composition in the present invention. The invention is characterized by the finding of the criticality of the amount of component (E) in the phososensitive resin composition.

The followings are obtained by the invention of photos of one sample of the reverse printing plate and a graphic view of the cross section of the plate.

190mm

85mm

15

reverse lines
dent dots
reverse characters

d1   d2   d3   t1

t2

In the upper photo, a plate shown below a pencil is the sample plate, 190 mm x 65 mm, comprising a base and relief formed thereon; and the lower photos are enlarged ones of three square sections in the upper photo, showing reverse lines, dent dots, and reverse characters, respectively.

In the cross-sectional graphic view, t1 indicates the thickness of the relief, i.e., the photocured area of the plate; t2 indicates the thickness of the base; and d1, d2,

and d3 indicate the depth of reverse lines, dent dots and reverse characters, respectively, in the relief.

The object of the present invention is to improve the depth of reverse lines (d1), depth of dent dots (d2) and depth of reverse characters (d3), and particularly it is important to improve depth of d1 and d2 each. If the depths of these non-printing areas are shallow, they will be filled with ink when the reverse printing plate is applied to printing, thereby resulting in that the intended images cannot be obtained. These problems are critical with μm-level reverse lines and dent dots.

In order to solve these problems in the invention, component (E) having the formula (I) is incorporated in an amount of 0.001 - 0.3 wt% into a resin composition for the printing plate, whereby the depths of the non-printing areas are improved.

OBJECT OF EXPERIMENT:

The object of the experiment is to show the criticality of the presently claimed range of 0.001 - 0.3 wt% of component (E) having the formula (I) of the present invention, and to support that unexpected results of the invention are exhibited only when component (E) is added in an amount of within the claimed range. For this, the experiment is perfomred by using N-ethyltoluenesulfonamide(NETS), which corresponds to component (E) having the formula (I) wherein -X represents $-SO_2NHR^2$, and is quite similar to mixed o,p-toluenesulfonamide disclosed in Pine (U. S. Patent No.

4,361,640), cited by the examiner.

COMPOSITION USED IN EXPERIMENT:

Ingredients	Amount (wt. pts.)
PVA	200
N-Methylolacrylamide	16.5
N-Methylolmethacrylamide	85
Trimethylolpropane	35
Polyethylene glycol diacrylate	33
"IRGACURE 651"	8
NH_4OH	1.68
Cupferron	0.13
Phosphoric acid	2.0
N-Ethyltoluenesulfonamide (NETS)	X
Total	381.3 + X

"IRGACURE 651": 2,2-dimethoxy-1,2-diphenylethane-1-one

METHOD OF EXPERIMENT:

Photosensitive resin plates were prepared, in which the amount (X) of N-ethyltoluenesulfonamide(NETS) was varied relative to 100 parts by weight of the total (381.3 parts by weight) of the ingredients except NETS. The method of preparing them is the same as in Examples described in the specification of the invention. The plates were exposed to light of 720 mJ/cm^2 or 1440 mJ/cm^2, then washed out with a plate brush, dried, and then subjected to post exposure to form a reverse printing image thereon.

The reverse image depth was measured at the reverse line of the sample plate, indicated by the figure 15 in the leftmost

enlarged photo, in which the line width is 150 μm.

Table 1 below shows the number of steps by "Step Tablet No. 2" of Eastman Kodak Corporation vs. the reverse image depth at exposure of 720 mJ/cm^2 and 1440 mJ/cm^2. In Table 1, the amount of NETS is in terms of % by weight.

The date of the number of steps vs. the reverse image depth given in Table 1 were plotted in a graph (not shown), from which the depth at 16 steps was obtained and shown in Table 1.

Table 1

NETS (wt.%)	720 mJ/cm^2		1440 mJ/cm^2		Depth at 16 steps (μm)
	Number of steps	depth (μm)	Number of steps	depth (μm)	
0.0	14.9	56.5	17.0	53.2	54.0
0.2	15.8	66.8	17.25	54.1	65.5
0.5	15.75	62.6	17.0	59.8	61.0
5.0	15.25	63.0	17.0	54.2	58.5
15.0	15.2	55.2	17.0	48.5	52.0
18.0	14.7	54.8	16.8	39.0	44.0

NETS: N-Ethyltoluenesulfonamide

Fig. 1 below is a graph showing the amount of NETS and the depth of the line at 16 steps (by "Step Tablet No. 2" of Eastman Kodak Corporation).

Fig. 1
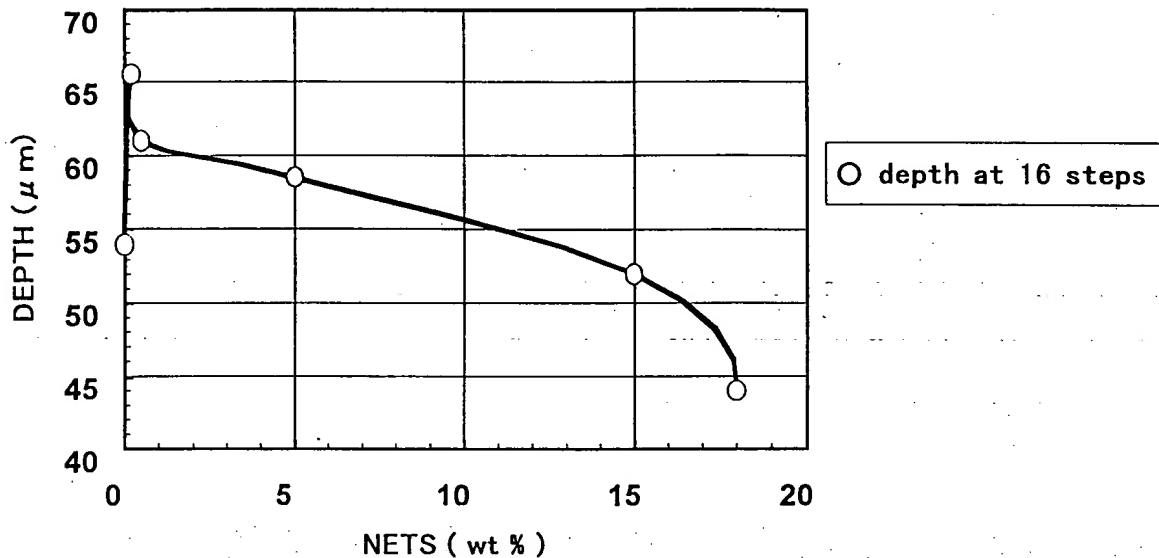
CONCLUSION:

As is clearly apparent from Fig. 1 above, the maximum depth of the reverse line was obtained at the amount of around 0.2 wt% of NETS in the composition. The data of the experiment support the criticality of the claimed range of 0.001 - 0.3 wt% of component (E) having the formula (I) in the reverse printing plate of the invention, for realizing the advantageous effects of the invention to deepen the reverse image depth of the printing plate and to improve the resolving properties thereof.

Fig. 1 shows that the reverse image depth is shallowed when the amount of NETS exceeds the claimed range of 0.001 - 0.3 wt%.

From the above, it is verified that the preferred range of 6 - 15 wt% of the plasticizers disclosed in Pine, U. S.

Patent No. 4,361,640, cited by the examiner, could not attain the remarkable effects of the present invention.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patents issued thereon.

Dated this 23 day of May, 2000

Hiroshi Takanashi
Hiroshi TAKANASHI